Demography India
Vol. 51, No. 2 (2022), pp.45-63 ISSN 0970-454X

ICDS System Strengthening Program: Impact on Nutrition and Health Counseling Coverage among Pregnant Women in Palghar, India

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Abstract: Systematic reviews show that nutrition and health counseling have significant impact on maternal and child health outcomes. The content and quality of counseling services, however, vary across contexts and there is limited evidence to understand such intricacies, especially in low-income settings. This study aims to contribute by providing evidence on the coverage of pregnancy-related nutrition and health counseling and its key components based on a systems strengthening project implemented in the tribal dominated district of Palghar in Maharashtra, India. The study is based on a before and after cross-sectional household survey design. The household survey was conducted during May-June, 2018 (baseline) and June-Aug, 2020 (endline) for assessing the coverage of various AWC services provided to the ICDS beneficiaries in the project area. A logistic regression analysis and item response theory based assessment is used to confirm the most difficult items in counseling. The study finds that the counseling coverage in 2020 was highest for thematic areas of maintaining personal hygiene and consumption of Iron Folic Acid supplementation whereas counseling on understanding danger signs during pregnancy, postnatal phase as well as among newborn and infants was lowest. Econometric analysis shows that between 2018 and 2020 the odds of recalling counseling improved for six thematic areas, remained same for three and worsened for remaining three areas (Tetanus Toxoid immunization during pregnancy, initiation of breastfeeding within one month and exclusive breastfeeding for first six months). The study findings suggest that in 2020 the counseling on items that are focused in second and third trimester may have been affected because of COVID-19 pandemic disruptions. In concluding, the paper calls for improving strategies for counseling and for devising mechanisms to allow greater focus on household visits and counseling by frontline workers.

Introduction

The Integrated Child Development Services (ICDS) scheme - jointly implemented by the union and the state governments in India – is designed to deliver six important services to children (0-6 years) as well as pregnant and lactating mothers. Nutrition and health education for pregnant women is one of the key ICDS services provided through a vast network of AWC (Anganwadi Centres or *courtyard shelters*) managed by a frontline worker – Anganwadi Worker (AWW). All ICDS functionaries are provided job training, refresher training and skill training from time to time. The AWW once recruited are provided job training for 26 working days at Anganwadi Training Center (AWTC). During this training programme, the Anganwadi Workers receive information on various policies and programmes related to women and children, early childhood care and education activities, health and nutrition care of children and women, community mobilisation, awareness, advocacy & IEC and management of AWC (GOI,2017; NIPCCD, 2006). Apart from above, the recently launched POSHAN Abhiyaan focuses on building the capacity of front-line ICDS functionaries by using Incremental Learning

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Approach (ILA) on thematic modules such as maternal care, new born care, infant and young child feeding practices, immunization and general services (such as mapping listing of households and home visit planning) (NITI Aayog, 2020).

The AWW is responsible for improving knowledge and awareness on nutrition and health related concerns and practices for children as well as pregnant and lactating mothers. Through individual as well as group counseling sessions, the AWWs aim to educate the beneficiaries on issues such as importance of early registration of the pregnancy, diet to be consumed during pregnancy, iron and folic acid (IFA) supplementation compliance and monitoring of weight gain. Support is also provided about importance of breastfeeding and identification of danger signs among both mother and child through counseling.

The strategic focus of ICDS finds support from various systematic reviews that report a significant impact of nutrition education and counseling (with or without nutrition supplementation) on maternal and child health outcomes (Girard and Olude, 2012; Ota et al., 2015; Bhutta et al., 2013; Vaivada et al., 2017). In fact the review on impact of nutrition advice found out that women who were given nutritional advice had a 54% lower relative risk of having a preterm birth (risk ratio (RR) 0.46, 95% CI 0.21 to 0.98, P value = 0.043), head circumference at birth was increased (mean difference 0.99 cm, 95% CI 0.43 to 1.55, P value = 0.00056 and protein intake increased (protein intake: MD +6.99 g/day, 95% CI 3.02 to 10.97, P value = 0.00057) (Ota et al., 2012). In addition, counseling or educational interventions are associated with 43% (P value = 0.00001) increase in levels of exclusive breastfeeding (EBF), with 89% and 20% (P value = 0.00001) of the increments noted in the context of developing and developed countries, respectively (Imdad et al., 2011). A meta-analysis of 37 studies shows that nutrition education and counseling had led to improvements in gestational weight (0.45 kg mean increase, p value .007), lower prevalence of anemia among pregnant women (by 30%, P value = 0.0002) and reduced risk of preterm births (by 19%, P value = 0.04) (Girard and Olude, 2012).

Studies in the Indian context, however, find mixed evidence on impact of nutrition and health education counseling interventions on maternal and child health. Receipt of IFA and counseling were found to be correlated in Bihar (Wendt et al., 2015). Similarly, nutrition education among pregnant women in Ghaziabad (Uttar Pradesh) led to improvements in both quality and quantity of the diets consumed and also increased the mean hemoglobin levels from 7.9 g/dL to 9.7 g/dL (Garg and Kashyap, 2006). However, evaluation of an intervention related to intensifying interpersonal counseling and community mobilization conclude that while these services led to improvements in gestational weight gain, exclusive breastfeeding, receipt and consumption of micronutrient supplements (IFA and calcium) but it did not lead to any significant changes in dietary diversity in the intervention area (Nguyen et al., 2021). Similar findings regarding lack of impact of counseling on coverage of complementary feeding practices among children aged 6-11months is noted in case of Ananya program in Bihar (Darmstadt et al., 2020). Even in urban slums of Delhi, counseling was not associated with micronutrient intake and anemia prevalence levels (Ghosh-Jerath et al., 2015).

The mixed impact of nutrition and health counseling in the Indian context is associated with factors such as poor quality of training and capacity building efforts, weak content, and gaps in monitoring and supportive supervision (Torlesse et al., 2021; Benedict et al., 2018). Small area studies also confirm the need for improved counseling for improved maternal and child health (Ansari and Khan, 2011). Similarly, the counseling coverage on specific components related to antenatal care (ANC) and on symptoms management had a wide range (30-80%) (Ghosh-Jerath et al., 2015). Despite such relevance of counseling, there is limited evidence on the coverage and content of counseling services among pregnant and lactating mothers across varying contexts in India (Torlesse et al., 2021). For instance, which components of counseling services are mostly covered and among these domains of counseling what all information is usually shared. Insights on such items can be helpful to improve focus of counseling services as well as training and capacity building of frontline workers. This study, therefore, aims to contribute by providing evidence on the coverage and recall of pregnancy-related nutrition and health counseling and its key components in Palghar district of Maharashtra, India.

The study area (Palghar) has high relevance because of a large concentration (37.4%) of scheduled tribes (ST) population who are largely illiterate (53% and 46% among males and females, respectively) and have huge dependency on rain-fed agriculture and forestry (Ghosh and Varerkar, 2019). As per the recently released nationally representative National Family Health Survey (NFHS-5) (IIPS, 2021), Palghar's continues to face significant nutrition challenges. The prevalence of stunting among children under 5 years is 33% and 37% are underweight. More than 50% women in 15-49 age group are anaemic and one in five women is underweight.

Besides, Palghar has been an intervention area for the ICDS system strengthening initiative – Project Spotlight - by the Government of Maharashtra and the Tata Trusts. Project Spotlight initiative has two-fold objectives: first, to improve the quality and coverage of services in the ICDS and National Health Mission (NHM) by focusing on trainings, demand generation, monitoring and a management information system that helps in managing the process, and; second, to improve nutritional practices and health seeking behavior of the communities at individual, family and community level for improved nutritional status of population. This Project was implemented in 2018 and aims to strengthen the existing delivery system and mobilize the community with an array of carefully planned activities. These includes refurbishing Anganwadi Centres (AWCs), building capacities of frontline workers by helping them converge with other delivery stakeholders, improving infant and young child feeding (IYCF) practices, and working with communities and Panchayati Raj Institutions (PRIs) to generate awareness on the causes and consequences of malnutrition in their area. To build capacity of frontline workers, a 3-day residential training program was organized. The curriculum was delivered through video presentations and hand-held lessons on role of nutrients in our body, local low cost food sources of essential nutrients, dietary diversity, effective breastfeeding positions through role play and video

sessions, initiation of complementary feeding, cooking demonstration for young child feeding and role of hygiene and sanitation. Since such elaborate sessions, require time of approximately 3-4 hours, participants were offered nutritious lunch which also seemingly improved attendance (Sharma et al., 2020).

Based on pre-post cross-sectional household survey design, this study also provides evidence on the association between the project activities and improvements in coverage of counseling services and its components. The specific objectives of the study are as follows: a) to estimate the coverage of counseling services and its various components both before and after the implementation of Project Spotlight in the district, and; b) to understand the difficult and less focused components in counseling services during pregnancy. The findings can offer policy insights for strengthening the AWC counseling services in such areas and also inform about needs for augmenting the counseling skills of frontline workers on difficult themes.

Data and Methods

The study is based on a cross-sectional household survey data collected by IQVIA Consulting and Information and Services Private Limited with ethical approval from the SIGMA Institutional Review Board. The household survey was conducted during May-June, 2018 (baseline) and June-Aug, 2020 (endline) for assessing the coverage of various AWC services provided to the ICDS beneficiaries in the project area. The sample was selected from 40 AWCs from 8 administrative blocks that were selected based on a stratified design. The AWCs were selected based on a stratified random sample with blocks serving as unit for stratification. The list of households (with children below 6 years of age) was obtained from the AWC registers and the eligible respondents were randomly selected from the list.

Sample size was calculated using the formula, $n= Z^2*p*(1-p)/d^2$

Where, Z=1.96, p= Proportion of pregnant women age 15-49 years who are anaemic in Maharashtra (.49) (NFHS-4), q= 1-p and d= margin of error = 5 %. Based on above formula a total of 200 women who had completed pregnancy at the time of survey were selected at baseline as well as at endline. The study comprises of a total sample of 400 women who had completed their pregnancies at the time of the survey. To avoid major recall bias on counseling services the study focused on women who had given births in the last six months from the date of survey. Structured interview schedules were used for the survey. The interview schedule covered sections like socio-demographic profile of the respondents, utilization of ICDS services among pregnant women, knowledge, attitude and practices towards utilizing supplementary nutrition services, health check-ups during pregnancy and health and nutrition education services offered by AWCs. The socio-demographic section comprises of age of the respondent, social group, education, type of ration card, employment status and household monthly income. It may be noted that while the baseline survey was conducted through household visits and in-

person interviews but the endline survey was conducted via telephonic means to follow the guidelines related to social distancing and other COVID-19 related protocols.

Percentages and frequency distribution of various demographic and socioeconomic characteristics are estimated and compared with coverage of counseling services and its various components. Altogether, information is presented on 12 areas and 30 specific items of counseling during pregnancy. The 12 thematic areas of counseling are as follows: i) early registration, ii) ANC check-ups, iii) IFA consumption, iv) danger signs during pregnancy, v) danger signs during post-natal period, vi) diet during pregnancy, vii) calcium consumption, viii) TT vaccine, ix) warning signs in newborn and young infants, x) early breastfeeding, xi) exclusive breastfeeding and xii) personal hygiene.

Receipt of counseling and recall abilities on such a vast range of topics is determined by difficulty level of the topic as well as individual-specific latent or unobservable factors. For this purpose, item response theory (IRT) based single parameter model is applied to understand the difficult items in counseling for the respondents (Hardouin et al., 2011; Raykov, & Marcoulides, 2018; Merlo et al., 2016; Statacorp, 2007). An item characteristic curve (ICC) is plotted to describe the probability that the respondent provides a correct recall for the counseling item. For interpretative purposes, the ICC curves which are toward the right reflect greater difficulties in recall whereas the curves on the left are more easily recalled by the respondents. The single parameter IRT model also provides the estimate of difficulty parameter (β) which represents the level of respondent ability necessary to recall a counseling item. For a specific counseling item, higher and positive values of the difficulty parameter reflects that a greater ability is required to recall the item whereas lower and negative values suggests that these items can be recalled without specific respondent abilities.

For analytical purposes, a PCA based index of counseling items for 12 thematic areas as well as 30 items within those thematic areas is also prepared to understand the performance across demographic and socioeconomic factors. The index is dichotomized and presented in two groups whereby those in the top 40% are designated to have good recall whereas those in the bottom 60% have poor recall. A logistic regression analysis is performed to understand the odds ratio of good recall across various demographic and socioeconomic factors. Finally, logistic regression is also used to calculate odds ratios (ORs) to compare the likelihood of improved recall of various counselling components and items. A dummy variable to distinguish the baseline and endline survey is used to understand the likelihood of improved recall that can be associated with activities under Project Spotlight. The OR for endline dummy is adjusted for key demographic and socioeconomic factors.

Results

The study sample is from a low-income setting. Most of the respondents have not completed primary education (70% in 2018 and 61% in 2020) and belong to below poverty line households (77%

in 2018 and 84% in 2020) based on the ration cards used for receiving food grains from public distribution system of the government (Supplementary Table S1). During baseline period 47% respondents were employed whereas this has decline to 13% in 2020. Given the socioeconomic profile of the region, direct interventions such as counseling on maternal and child health and nutrition as well as strengthening of services for education are critical to improve population health.

The status of counseling coverage in 2020 across 12 broad thematic areas shows that almost all the respondents have received counseling on importance of maintaining personal hygiene (97% in 2020) and consumption of IFA supplements (90% in 2020). Receipt of counseling on understanding danger signs has lowest coverage in 2020. This includes identification of danger signs during post-natal period (55% in 2020), during pregnancy (66% in 2020) or among newborn and young infants (67% in 2020).

Table 1: Coverage of thematic areas for counseling among pregnant women, Palghar, 2018 and 2020

Thematic areas for counseling	2018		2020		Change
	N	%	N	%	(2018-20)
Importance of early registration (in first trimester)	110	55	140	70	15**
Importance of ANC Check-ups during pregnancy	130	65	155	77	12**
Importance of consumption of (IFA) tablets/syrup during pregnancy	154	77	181	90	13***
Danger signs during pregnancy	105	52	133	66	14**
Danger signs during post-natal period	70	35	111	55	20***
Diet counseling	163	81	167	83	2
Importance of consumption of calcium during pregnancy	145	72	172	86	13***
TT immunization during pregnancy	180	90	150	75	-15***
Warning signs in the new born and young infants	117	58	135	67	9
Importance of initiating breastfeeding within an hour of birth	169	84	163	81	-3
Importance of exclusive breastfeeding the baby up to 6 months	162	81	140	70	-11*
Importance of maintaining personal hygiene	154	77	195	97	20***

Note: ***, ** and * denotes significance at 1%, 5% and 10% level. % Change obtained by using two-sample t test with equal variances.

Compared to 2018, counseling during pregnancy in 2020 shows a significant increase in 9 of the 12 thematic areas identified for counseling services (Table 1). Compared to baseline figures of 77% in 2018, counseling on importance of maintaining personal hygiene increased to 97% in 2020. A similar 20 percentage point increase is noted in case of counseling on danger signs during post-natal period of pregnancy (from 35% in 2018 to 55% in 2020). Diet counseling improved marginally from 81% in 2018 to 83% in 2020. In three of the 12 thematic areas a decline in counseling coverage is noted. These are as follows: a) TT immunization during pregnancy (90% in 2018 to 75% in 2020), b) exclusive breastfeeding for six months (81% in 2018 to 70% in 2020) and c) initiating breastfeeding in first hour after birth (84% in 2018 to 81% in 2018).

Coverage of counseling on 30 specific components within these broad 12 thematic areas is also examined (Table 2). In 2020, highest coverage is reported for the counseling item of hand washing with soap and water after defecation (90% in 2020) followed by importance of hand washing with soap and water before each meal (83% in 2020). The three lowest reported counseling items in 2020 are as follows: signs of convulsions (1.5% in 2020), baby's body temperature and cold body (5.5% in 2020) and inclusion of vitamin C rich food in diet (12.5% in 2020). Compared to baseline figures, increase is

noted in knowledge about early detections and treatment of pregnancy complications (from 10% in 2018 to 35% in 2020), development of brain of the baby (55.5% in 2018 to 77% in 2020) and nails should be trimmed (from 52% in 2018 to 72% in 2020). Significant reductions counseling knowledge was noted for all items of warning signs among newborn whereby the coverage declines range from 25% in case of baby's body temperature and cold body to 28.5% in case of baby unable to cry or difficulty in breathing.

Table 2: Coverage of specific components under various thematic areas of counseling for pregnant women, Palghar, 2018 and 2020

Thematic areas and components of counseling	2018		2020		Change
	N	%	N	%	(2018-20)
Early registration					
Recalling of correct date of period/expected delivery	86	43.0	78	39.0	-4
Early detection of complications	60	30.0	94	47.0	17***
Use of safe abortion services	59	29.5	49	24.5	-5
Preventing neural tube defects	2	1.0	31	15.5	14.5***
ANC benefits					
Improving health of mother	124	62.0	130	65.0	3
Giving birth to healthy baby	117	58.5	95	47.5	-11*
Early detections and treatment of complications	20	10.0	70	35.0	25***
IFA consumption					
Development of brain of baby	111	55.5	154	77.0	21.5***
Reduced risk of iron deficiency anemia in pregnant women	125	62.5	137	68.5	6
Help in overall fetal growth	86	43.0	103	51.5	8.5
Diet counseling					
Need for additional dietary intake	100	50.0	72	36.0	-14
Eating green leafy vegetables, ragi, jowar, bajra, pulses etc.	163	81.5	87	43.5	-38***
Inclusion of Vitamin C rich food in diet	113	56.5	25	12.5	-44***
Calcium consumption					
Build strong bones and teeth of baby	129	64.5	135	67.5	3
Growth of healthy heart, nerves, and muscles of baby	77	38.5	79	39.5	1
Reduced risk of hypertension during pregnancy	41	20.5	49	24.5	4
TT immunization					
TT immunization protects mother and baby	130	65.0	102	51.0	-14**
Two doses of TT during pregnancy	138	69.0	82	41.0	-28***
Warning signs in newborn					
Weak suck or refusing to breastfeed	136	68.0	80	40.0	-28***
Baby unable to cry or difficulty in breathing	129	64.5	72	36.0	-28.5***
Yellow palms and soles of baby	83	41.5	27	13.5	-28***
Baby is cold to touch	61	30.5	11	5.5	-25***
Signs of convulsions	56	28.0	3	1.5	-26.5***
Exclusive breastfeeding					
Delayed return of menstruation for mother	36	18.0	37	18.5	0.5
It helps baby to grow and develop properly	110	55.0	106	53.0	-2
Personal Hygiene					
Hand washing with soap and water after defecation	178	89.0	180	90.0	1
Having a bath every day without fail	169	84.5	159	79.5	-5
Hand washing with soap and water before having each meal	131	65.5	165	82.5	17***
Nails should be trimmed	104	52.0	144	72.0	20***
Wearing clean and washed clothes daily	156	78.0	153	76.5	-1.5

Note: ***, ** and * denotes significance at 1%, 5% and 10% level. % Change obtained by using two-sample t test with equal variances

Information and messages on some of the thematic areas of pregnancy-related counseling are more easily received than certain others. Table 3 and 4 present insights from item response theory based difficulty parameter coefficients to understand relatively simpler and difficult thematic areas in counseling as well as difficult counseling items under these areas. A negative coefficient implies that the specific counseling area or item is relatively easier to be understood or recalled whereas a positive coefficient implies difficulties. Besides, a large value of the coefficient also implies higher difficulty. In 2018, counseling areas such as understanding of danger signs during postnatal period (difficult parameter 0.52; 95% confidence interval [0.27; 0.77]) and pregnancy (-0.08; [-0.32; 0.15]) was relatively difficult.

Also, comprehending the benefits of early registration in first trimester (-0.17; [-0.40; 0.07]) was also relatively difficult area in counseling. Focus on TT immunization (-1.76; [-2.14; -1.38]), breastfeeding in first hour (-1.38; [-1.71; -1.06]) and dietary intake (-1.22; [-1.52; -0.91]) were relatively easier areas in counseling across beneficiaries. However, in 2020, counseling on personal hygiene (-2.55; [--3.13; -1.98]) was more widespread and easier whereas counseling on danger signs in postnatal period (-0.18; [-0.39; 0.04]) continued to be a difficult area. Counseling on IFA supplementation (-1.67; [-2.02; -1.31]) was also well-received in 2020 than during the baseline period (-1.00; [-1.28; -0.72]). In terms of specific items, hand washing with soap and water after defecation remains as the most easily captured counseling message both in the years 2018(-2.66; [-3.28; -2.04]) and 2020 (-2.63; [-3.24; -2.03]). In 2020, counseling messages around personal hygiene such as bathing every day without fail, trimming the nails, wearing clean and washed clothes daily is relatively easier to recall.

Table 3: Single parameter logistic model based estimates for item difficulty parameter for various thematic areas of counseling, Palghar, 2018 and 2020

Thematic areas for counseling	**2018**		**2020**	
	Coefficient	95% CI	Coefficient	95% CI
TT immunization during pregnancy	-1.76***	[-2.14 ,-1.38]	-0.85***	[-1.1 ,-0.6]
Initiating breastfeeding within an hour of birth	-1.38***	[-1.71 ,-1.06]	-1.13***	[-1.41 ,-0.85]
Diet counseling	-1.22***	[-1.52 ,-0.91]	-1.23***	[-1.52 ,-0.94]
Importance of exclusive breastfeeding for 6 months	-1.19***	[-1.49 ,-0.89]	-0.66***	[-0.89 ,-0.43]
Importance of maintaining personal hygiene	-1.00***	[-1.28 ,-0.72]	-2.55***	[-3.13 ,-1.98]
Importance of (IFA) tablets/syrup during pregnancy	-1.00***	[-1.28 ,-0.72]	-1.67***	[-2.02 ,-1.31]
Importance of calcium during pregnancy	-0.81***	[-1.07 ,-0.54]	-1.37***	[-1.67 ,-1.06]
Importance of ANC Check-ups during pregnancy	-0.52***	[-0.76 ,-0.27]	-0.95***	[-1.21 ,-0.69]
Warning signs in the new born and young infants	-0.29***	[-0.52 ,-0.05]	-0.57***	[-0.8 ,-0.34]
Importance of early registration (in first trimester)	-0.17	[-0.4 ,0.07]	-0.66***	[-0.89 ,-0.43]
Danger signs during pregnancy	-0.08	[-0.32 ,0.15]	-0.54***	[-0.76 ,-0.31]
Danger signs during post-natal period	0.52***	[0.27 ,0.77]	-0.18	[-0.39 ,0.04]

Note: ***, ** and * denotes significance at 1%, 5% and 10% level.

On the other hand, recalling danger signs such as signs of convulsions (4.77; [3.45; 6.10]) and signs of baby being cold (3.34; [2.58; 4.11]) or having yellow palms and sole (2.24; [1.71; 2.77]) was relatively more difficult in 2020. In 2018, counseling on hand washing with soap and water after defecation (-2.66; [-3.28; -2.04]) was the easiest items whereas recalling counseling on prevention of neural tube defects (5.55; [3.85; 7.26]) was most difficult. Altogether, in 2018 about 12 of the selected 30 counseling items were difficult to be recalled or retained by the beneficiary whereas in 2020 a total of 15 items were showing significant difficulty parameters.

Table 4: Single parameter logistic model based estimates for item difficulty parameter for specific components of counseling under various thematic areas, Palghar, 2018 and 2020

Thematic areas for counseling	2018		2020	
	Coefficient	95% CI	Coefficient	95% CI
Hand washing with soap and water after defecation	-2.66***	[-3.28 ,-2.04]	-2.63***	[-3.24 ,-2.03]
Having a bath every day without fail	-2.18***	[-2.71 ,-1.64]	-1.66***	[-2.11 ,-1.21]
Eating green leafy vegetables, ragi, jowar, bajra etc.	-1.91***	[-2.41 ,-1.41]	0.33	[-0.02 ,0.68]
Wearing clean and washed clothes daily	-1.64***	[-2.1 ,-1.18]	-1.45***	[-1.87 ,-1.03]
Two doses of TT during pregnancy	-1.04***	[-1.45 ,-0.64]	0.46***	[0.1 ,0.81]
Weak suck or refusing to breastfeed	-0.98***	[-1.38 ,-0.59]	0.51***	[0.15 ,0.86]
Hand washing with soap and water before each meal	-0.84***	[-1.23 ,-0.45]	-1.89***	[-2.37 ,-1.41]
TT immunization protects mother and child	-0.81***	[-1.2 ,-0.42]	-0.05	[-0.39 ,0.3]
Baby unable to cry or difficulty in breathing	-0.78***	[-1.17 ,-0.4]	0.72***	[0.35 ,1.08]
Build strong bones and teeth of baby	-0.78***	[-1.17 ,-0.4]	-0.90***	[-1.28 ,-0.53]
Reduced risk of iron deficiency anemia in pregnancy	-0.67***	[-1.05 ,-0.29]	-0.96***	[-1.34 ,-0.58]
ANC helps improving health of mother	-0.64***	[-1.02 ,-0.26]	-0.77***	[-1.13 ,-0.4]
Giving birth to healthy baby	-0.45**	[-0.82 ,-0.08]	0.13	[-0.22 ,0.47]
Inclusion of Vitamin C rich food in diet	-0.34*	[-0.71 ,0.02]	2.34***	[1.8 ,2.89]
IFA helps development of brain of baby	-0.29	[-0.66 ,0.08]	-1.48***	[-1.91 ,-1.06]
Calcium helps baby to grow and develop properly	-0.26	[-0.63 ,0.1]	-0.15	[-0.49 ,0.2]
Nails should be trimmed	-0.11	[-0.47 ,0.26]	-1.16***	[-1.56 ,-0.77]
Need for additional dietary intake	0.00	[-0.36 ,0.36]	0.72***	[0.35 ,1.08]
Recalling of correct date of period/expected delivery	0.37**	[0 ,0.74]	0.56***	[0.2 ,0.91]
IFA helps in overall fetal growth	0.37**	[0 ,0.74]	-0.07	[-0.42 ,0.27]
Yellow palms and soles of baby	0.45**	[0.08 ,0.82]	2.24***	[1.71 ,2.77]
Calcium helps growth of healthy heart, nerves, and muscles of baby	0.61***	[0.24 ,0.99]	0.53***	[0.18 ,0.89]
Baby is cold to touch is a warning sign	1.08***	[0.67 ,1.48]	3.34***	[2.58 ,4.11]
Early detection of complications	1.11***	[0.7 ,1.51]	0.15	[-0.19 ,0.5]
Use of safe abortion services	1.14***	[0.73 ,1.55]	1.39***	[0.97 ,1.8]
Signs of convulsions	1.23***	[0.81 ,1.65]	4.77***	[3.45 ,6.1]
Reduced risk of hypertension during pregnancy	1.75***	[1.28 ,2.23]	1.39***	[0.97 ,1.8]
Delayed return of menses for mother	1.95***	[1.45 ,2.46]	1.81***	[1.34 ,2.27]
Early detections and treatment of complications	2.79***	[2.14 ,3.43]	0.77***	[0.4 ,1.14]
Preventing neural tube defects	5.55***	[3.85 ,7.26]	2.06***	[1.56 ,2.56]

Note: ***, ** and * denotes significance at 1%, 5% and 10% level.

A PCA based counseling items index is created to understand whether counseling components are associated with socioeconomic background of the beneficiary households. Counseling items such as advice on safe abortion services, role of calcium in development of healthy heart, nerves and muscles

of baby and recalling of correct date of periods and expected date of delivery assume higher weights in the PCA based counseling index (Supplementary Table S2 and S3). Items such as general information about personal hygiene receive lower weights in counseling index, specifically in 2020. The logistic regression based odds ratio suggests that in 2018 much of the counseling receipt of specific items was associated with income status of the beneficiary households (Supplementary Table S4). For instance, those with higher monthly household income had higher likelihood of being in top two quintiles of the counseling index. However, in 2020 the counseling index does not show any significant association with household background characteristics.

Finally, Tables 5 and 6 describe whether there was a change between 2018 and 2020 in the likelihood of recall and receipt of counseling under the 12 thematic areas. This change can be also associated with the ICDS systems strengthening activities undertaken through Project Spotlight. Table 5 shows that out of the 12 thematic areas of counseling services during pregnancy, significant improvements in likelihood of recall are noted for six areas, reduced likelihood are estimated for three areas and no significant change is observed for the remaining three areas. Adjusting for key demographic and socioeconomic characteristics, the logistic regression reveals significant improvements in recall of counseling on personal hygiene (Odds Ratio, OR, 14.57; 95% confidence interval [5.04; 42.10]), IFA supplementation (OR 3.56; [1.72; 7.38]), calcium supplementation (OR 2.14; [1.13; 4.05]), ANC check-ups (OR 2.11; [1.21; 3.70]), early registration of pregnancy (OR 2.07; [1.23; 3.49]) and recognition of danger signs during postnatal period (OR 1.99; [1.19; 3.31]).

Table 5: Logistic regression-based odds ratio for likelihood of coverage of counseling components in post-intervention scenario, Palghar, 2018 and 2020

Thematic areas for counseling	Odds Ratio (2020 vs 2018)	95% CI	Psuedo R^2
Importance of maintaining personal hygiene	14.57***	[5.04,42.10]	0.243
Importance of consumption of (IFA) tablets/syrup during pregnancy	3.56***	[1.72,7.38]	0.183
Importance of consumption of calcium during pregnancy	2.14*	[1.13,4.05]	0.163
Importance of ANC Check-ups during pregnancy	2.11**	[1.21,3.70]	0.119
Importance of early registration (in first trimester)	2.07**	[1.23,3.49]	0.102
Danger signs during post-natal period of pregnancy	1.99**	[1.19,3.31]	0.130
Danger signs during pregnancy	1.59	[0.95,2.67]	0.130
Diet counseling	1.36	[0.70,2.65]	0.165
Warning signs in the new born and young infants	1.22	[0.73,2.04]	0.092
Importance of exclusive breastfeeding the baby up to 6 months	0.46*	[0.26,0.84]	0.144
Importance of initiating breastfeeding within an hour of birth	0.36**	[0.18,0.73]	0.148
TT immunization during pregnancy	0.21***	[0.10,0.44]	0.220

Note: The Odds Ratio compares the odds of receiving counseling services for different components in 2020 with reference to 2018. The model is adjusted for socioeconomic correlates including age, education and income (Supplementary Table S2)

***, ** and * denotes significance at 1%, 5% and 10% level.

Table 6: Logistic regression-based odds ratio for likelihood of coverage of specific counseling components in post-intervention scenario, Palghar, 2018 and 2020

Thematic areas and components of counseling	OR	95% CI	N	Pseudo R^2
Early registration				
Recalling of correct date of period/expected delivery	0.88	[0.53,1.47]	378	0.064
Early detection of complications	2.87***	[1.67,4.92]	400	0.117
Use of safe abortion services	0.80	[0.45,1.41]	378	0.070
Preventing neural tube defects	27.62***	[5.24,145.60]	378	0.250
ANC benefits				
Improving health of mother	1.25	[0.74,2.12]	400	0.116
Giving birth to healthy baby	0.70	[0.43,1.15]	400	0.077
Early detections and treatment of complications	7.09***	[3.46,14.52]	378	0.160
IFA consumption				
Development of brain of baby	2.24**	[1.29,3.90]	400	0.150
Reduced risk of iron deficiency anemia in pregnant women	2.68***	[1.56,4.62]	400	0.103
Help in overall fetal growth	1.90*	[1.14,3.16]	400	0.096
Diet counseling				
Need for additional dietary intake	0.45**	[0.27,0.75]	400	0.080
Eating green leafy vegetables, ragi, jowar, bajra, pulses etc.	0.16***	[0.09,0.28]	400	0.172
Inclusion of Vitamin C rich food in diet	0.06***	[0.03,0.12]	400	0.254
Calcium consumption				
Build strong bones and teeth of baby	0.79	[0.47,1.36]	400	0.080
Growth of healthy heart, nerves, and muscles of baby	0.89	[0.52,1.51]	378	0.087
Reduced risk of hypertension during pregnancy	1.32	[0.73,2.39]	378	0.040
TT immunization				
TT immunization protects mother and baby	0.23***	[0.13,0.42]	400	0.194
Two doses of TT during pregnancy	0.23***	[0.13,0.39]	400	0.130
Warning signs in newborn				
Weak suck or refusing to breastfeed	0.22***	[0.13,0.38]	400	0.133
Baby unable to cry or difficulty in breathing	0.22***	[0.13,0.38]	400	0.109
Yellow palms and soles of baby	0.11***	[0.06,0.21]	400	0.169
Baby is cold to touch	0.09***	[0.04,0.19]	400	0.217
Signs of convulsions	0.03***	[0.01,0.09]	378	0.251
Exclusive breastfeeding				
Delayed return of menstruation for mother	1.05	[0.55,2.01]	378	0.075
It helps baby to grow and develop properly	0.90	[0.55,1.47]	400	0.060
Personal Hygiene				
Hand washing with soap and water after defecation	1.54	[0.66,3.59]	375	0.080
Having a bath every day without fail	0.96	[0.50,1.83]	400	0.109
Hand washing with soap and water before having each meal	2.91***	[1.62,5.22]	400	0.111
Nails should be trimmed	2.06**	[1.21,3.53]	400	0.154
Wearing clean and washed clothes daily	0.97	[0.54,1.73]	400	0.046

Significant reductions in odds of recalling was noted for counseling in the areas of TT immunization during pregnancy (OR 0.21; [0.10; 0.44]), initiation of breastfeeding within one month (OR 0.36; [0.18; 0.73]) and exclusive breastfeeding for first six months (OR 0.46; [0.26; 0.84]). No significant changes in recall abilities are noted for counseling areas related to diets, danger signs during pregnancy and warning signs in newborn and young infants. Item specific odds ratio presented in Table

6 confirms these findings. In particular, there are considerable reductions in odds of recalling warning signs among newborn as well as diet counseling. Partly, this pattern can be associated with the fact that these items are considered for counseling toward the second and third trimester of pregnancy. Therefore, it is plausible that counseling on these items may have been affected because of COVID-19 disruptions.

Discussion

This study examines the coverage of counseling services and its various components both before and after the implementation of Project Spotlight in Palghar. This is an important contribution because of limited focus on counseling issues in low-income settings. The four salient findings of the study are as follows. First, across 12 thematic areas, the counseling coverage in 2020 was highest for thematic areas of maintaining personal hygiene and consumption of IFA supplements. Whereas, counseling coverage on understanding danger signs during pregnancy, postnatal phase as well as among newborn and infants was lowest. Second, counseling messages around personal hygiene such as bathing every day without fail, trimming the nails, wearing clean and washed clothes daily is relatively easier to recall. But recalling counseling items such as danger signs including convulsions, baby being cold or having yellow palms and sole was relatively difficult. Third, in 2018 about 12 of the selected 30 counseling items were more difficult to be recalled by the respondents whereas in 2020 a total of 15 items were showing significant difficulty parameters. Finally, compared to baseline figures, the odds of recall in counseling improved for six areas, remained same for three and worsened for remaining three areas (TT immunization during pregnancy, initiation of breastfeeding within one month and exclusive breastfeeding for first six months).

This study, however, is not free from limitations. Firstly, the study is based on a before and after cross-sectional household survey design and does not allow us to evaluate the causal impact of the change in coverage of counseling services. Second, the data also does not permit inferences regarding the quality of the counseling services in the study area. It is likely that in the absence of quality counseling, improving coverage alone does not necessarily translate into better knowledge and awareness. Besides, the counseling on health and nutrition is provided through various frontline workers including those focused under Project Spotlight. The analysis, however, is not able to associate the changes with all possible sources of information. To document the impact of the counseling interventions remain a future endeavor. Thirdly, the baseline and endline survey was conducted through household visits and telephonic interviews, respectively. A difference in the data collection approach may potentially affect data capture and responses because of various reasons including time and convenience of the respondents.

Health counseling interventions are targeted at modifying the behavior of the beneficiaries and are one of the most cost effective strategies to achieve the desired goals of reducing maternal and child mortality; and to improve nutrition outcomes (Bhutta et al., 2013;Wong and Radin, 2019). It is worth reiterating here that these interventions are aimed at only providing information to the pregnant mothers

about the importance and benefits of the health care services and timely check-ups. Although in this study we do not evaluate the impact of the intervention but nutrition education and counseling with or without nutrition supplementation is associated with improved maternal and child health indicators (Girard and Olude, 2012; Ota et al., 2015; Bhutta et al., 2013; Vaivada et al., 2017).

Although we observe a high coverage of ICDS counseling services but estimates based on the National Family Health Survey (NFHS 2015-16) indicates that the use of ICDS services is low in case of Maharashtra. The low coverage of ICDS services is attributable to a host of factors such as poor quality of training of the Anganwadi workers, weak content, and gaps in monitoring and supportive supervision (Torlesse et al., 2021; Benedict et al., 2018). Also, NFHS (2015-16) shows that ICDS service utilization is relatively higher in rural areas but a majority of mothers and children still do not receive benefits in rural areas (Rajpal et al., 2020; Chakrabarti et al., 2019). This call for revisiting the program design and implementation in rural areas whereby efforts for systems strengthening by engaging with frontline workers and grass-root level stakeholders such as local-self government units (*Panchayati Raj* Institutions) is planned (Saxena and Srivastava, 2019). Project Spotlight adopted such an approach of training and capacity building of frontline workers and also created a positive atmosphere for health and nutrition discussions in the community by approaching local leaders, community representatives and district and sub-district level program officials from various line departments of the state government. With such initiatives, it is noted that there are overall improvements in counseling coverage even though there are certain thematic areas for further efforts and engagements.

The evidence shows that a higher percentage of women in endline survey report being counseled about various AWC services. However, there remains plenty of scope to improve awareness about importance of early registration, ANC checkups, TT immunization and warning signs. This perhaps requires identification of the groups which have not been reached through the intervention. To realize the impact on fetal, infant and maternal health outcomes it is paramount that coverage of all the services are increase in which counseling services can play a significant role. It is also critical that AWW are provided training and skill to effectively disseminate the information. There are multiple workers assigned with the role of counseling. A clear demarcation of roles and responsibilities is required to improve efficiency. Further research is required on understanding the delivery mechanism as well as quality of services (Torlesse et al., 2021). Also, time allocation issues of these frontline workers should be addressed for improving focus on their main tasks as specified under the ICDS services. Studies have noted that AWWs are required to devote substantial time on administrative aspects of AWCs which disallows them to spend more time on direct care or home visits (Jain et al., 2020).

Finally, it is worth noting that the baseline survey was conducted in a pre-COVID-19 year whereas the endline survey was conducted during the first wave of the COVID-19 pandemic in India. It is likely that the counseling services might have been affected because of the COVID-19 lockdown and subsequent disruptions of various services (Jungari, 2020; Goyal et al., 2021). Also, frontline workers were engaged in COVID-19 related activities (Nanda et al., 2020). This may have also affected the counseling services among pregnant women. The counseling indicators here are suggestive of such an effect. For instance, it is noted that the counseling advice on breastfeeding as well as on warning signs for babies has noted a decline between baseline and endline. This may be possible because such counseling is often undertaken toward the later stages of the pregnancy whereas early counseling would focus on ANC registration, micronutrient supplementation and related benefits. Thus, it is possible that in the absence of the pandemic Project Spotlight on ICDS systems strengthening could have yielded more benefits for Palghar than what is estimated presently.

In concluding, the important policy implications of the study are as follows. First, it is important to ensure constant training and capacity building of the frontline workers to effectively engage in various aspects of counseling including the mode of counseling and interaction with the beneficiaries. This may also imply greater time allocation by the AWWs toward counseling services than what is currently stipulated as per the ICDS guidelines. Second, counseling on danger signs during pregnancy and during infancy and childhood needs to be strengthened as these were some of the lowest reported counseling items. This may also need repeated counseling of the beneficiaries to help them understand these topics. Frontline workers from other line departments such as the ANMs and ASHAs can also be trained contribute significantly toward counseling services. Third, COVID-19 may have affected coverage of services especially among women who were pregnant and lactating during the lockdown phase of the first wave. New methods for counseling and communication to reach out to the beneficiaries should be developed to overcome limitations related to mobility and in-person counseling. Unless the efforts to strengthen the nutrition and health counseling are bolstered it will be difficult for India to achieve the maternal and child mortality targets related to third Sustainable Development Goal (SDGs).

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Demography India
Vol. 51, No. 2 (2022), pp.45-63 ISSN 0970-454X

Supplementary Table S1: Background characteristics of the sample, Palghar 2018 and 2020

Background characteristics	Baseline (2018)		Endline (2020)	
Education level	N	%	N	%
Up to Primary	141	70	122	61
Above Primary	59	29	78	39
Poverty status				
Above poverty line (APL)	16	8	18	9
Below poverty line (BPL)	155	77	168	84
Do not know	29	14	14	7
Employment status				
Not employed	105	52	173	86
Employed	95	47	27	13
Household income quintiles				
Lowest	68	34	16	8
Second	52	26	46	23
Middle	25	12	86	43
Fourth	21	10	7	3
Highest	34	17	45	22
All	200	100	200	100

Supplementary Table S2: Principal component analysis (PCA) based weights for various thematic areas of counseling, Palghar, 2018 and 2020

Thematic areas for counseling	2018	2020
Importance of early registration (in first trimester)	0.53	0.65
Importance of ANC Check-ups during pregnancy	0.62	0.81
Importance of consumption of (IFA) tablets/syrup during pregnancy	0.67	0.93
Danger signs during pregnancy	0.57	0.69
Danger signs during post-natal period of pregnancy	0.50	0.63
Diet counseling	0.89	0.79
Importance of consumption of calcium during pregnancy	0.70	0.96
TT immunization during pregnancy	0.80	0.73
Warning signs in the new born and young infants	0.58	0.67
Importance of initiating breastfeeding within an hour of birth	0.70	0.51
Importance of exclusive breastfeeding the baby up to 6 months	0.82	0.53
Importance of maintaining personal hygiene	0.73	0.89

Table S3: Principal component analysis (PCA) based weights for specific components of counseling under various thematic areas, Palghar, 2018 and 2020

Thematic areas for counseling	2018	2020
Use of safe abortion services	0.69	0.73
Calcium helps growth of healthy heart, nerves, and muscles of baby	0.60	0.56
Recalling of correct date of period/expected delivery	0.59	0.61
Delayed return of menstruation for mother	0.59	0.70
Inclusion of Vitamin C rich food in diet	0.53	0.51
Eating green leafy vegetables, ragi, jowar, bajra, pulses etc.	0.50	0.02
TT immunization protects mother and baby	0.50	0.53
Hand washing with soap and water after defecation	0.50	-0.29
Early detection of complications	0.49	0.52
Reduced risk of hypertension during pregnancy	0.49	0.65
Early detections and treatment of complications	0.48	0.48
Nails should be trimmed	0.48	-0.19
Hand washing with soap and water before having each meal	0.46	-0.15
IFA helps development of brain of baby	0.45	0.42
Calcium helps build strong bones and teeth of baby	0.43	0.46
ANC helps improving health of mother	0.41	0.50
Having a bath every day without fail	0.41	-0.32
Wearing clean and washed clothes daily	0.38	-0.24
Giving birth to healthy baby	0.36	0.46
Need for additional dietary intake	0.23	0.01
Preventing neural tube defects	0.21	0.63
Reduced risk of iron deficiency anemia in pregnant women	0.21	0.18
Yellow palms and soles of baby	0.21	0.39
Baby unable to cry or difficulty in breathing	0.20	0.27
Weak suck or refusing to breastfeed	0.18	0.22
Signs of convulsions	0.09	0.11
Two doses of TT during pregnancy	0.04	0.24
Baby is cold to touch is a warning sign	0.00	0.20
Calcium helps baby to grow and develop properly	-0.11	0.04
IFA helps in overall fetal growth	-0.12	0.14

Supplementary Table S4: Logistic regression based odds ratio for the likelihood of ranking in top two quintiles of counseling index based on PCA, Palghar, 2018 and 2020

Background variables	Thematic areas		Specific components	
	2018	2020	2018	2020
Education				
Up to Primary	1.00	1.00	1.00	1.00
Above Primary	1.84	0.55	1.24	1.52
Poverty status				
APL	1.00	1.00	1.00	1.00
BPL	0.92	1.20	2.63	1.29
DNK	0.45	0.49	1.98	0.41
Employment status				
Not employed	1.00	1.00	1.00	1.00
Employed	1.10	1.05	1.16	1.06
Household monthly income				
Lowest	1.00	1.00	1.00	1.00
Second	1.15	0.64	3.73***	0.41
Middle	1.03	2.86	4.07**	1.48
Fourth	0.30*	0.54	3.10*	0.92
Highest	0.82	2.18	5.00**	1.48
N	200	200	200	200
Pseudo R^2	0.050	0.093	0.088	0.059

Demography India
Vol. 51, No. 2 (2022), pp.45-63 ISSN 0970-454X

Supplementary Table S5: Logistic regression-based odds ratio for likelihood of coverage of counseling components in post-intervention scenario, Palghar 2018 and 2020

Components*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Year												
2018	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2020	2.07**	2.11**	3.56***	1.59	1.99**	1.36	2.14*	0.21***	1.22	0.36**	0.46*	14.57***
Education												
Up to Primary	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Above Primary	0.87	0.88	1.30	0.66	0.63	0.75	1.45	0.90	1.02	1.05	0.66	1.13
Poverty status												
APL	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
BPL	0.75	0.45	0.54	0.78	0.79	0.96	0.71	0.99	1.75	2.45	1.37	1.18
DNK	1.21	0.62	0.57	0.53	0.50	0.82	0.98	0.59	1.35	0.97	0.51	1.00
Employment status												
Not employed	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Employed	1.49	1.21	1.16	0.95	0.63	1.07	1.21	1.34	0.68	0.44*	0.83	1.47
Income quintile												
Lowest	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Second	1.53	0.60	0.65	0.38**	0.37**	0.29**	0.74	0.56	0.55	1.13	0.39*	1.01
Middle	1.87	0.88	0.74	1.08	0.95	0.52	1.74	3.15*	1.09	3.52*	0.95	1.30
Fourth	1.72	0.38*	0.19**	0.32*	0.61	0.42	0.30*	1.08	0.35*	0.84	0.39	0.55
Highest	2.48*	0.89	0.55	0.88	1.02	0.68	1.56	1.37	0.82	2.13	0.65	1.25
Blocks												
Dahanu	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Jawahar	2.96*	4.47**	5.58**	3.17*	2.44	14.85***	5.98**	17.64***	3.48**	4.61	8.14**	10.12**
Mokhada	1.59	2.25	2.07	0.88	0.76	2.09	1.10	1.32	1.87	0.35	1.16	1.74
Palghar	2.22	8.06**	1.30	3.13*	1.83	3.70*	2.87	9.84**	1.80	0.41	1.03	1.08
Talasari	2.31	3.60*	1.00	5.55*	3.30*	2.87	2.65	1.88	2.66	0.50	0.84	1.00
Vada	1.23	2.89	4.67	2.06	1.33	18.24**	2.28	2.21	1.67	0.81	3.23	3.69
Vasai	0.13**	0.25*	0.14**	0.25*	0.15*	0.25*	0.20*	0.72	0.27	0.27	0.41	0.47
Vikramgad	1.67	2.76*	1.56	1.44	1.34	3.08*	1.33	3.63*	2.57*	0.86	1.13	3.43*
N	400	400	377	400	400	400	400	400	400	400	400	377
Pseudo R^2	0.102	0.119	0.183	0.130	0.130	0.165	0.163	0.220	0.092	0.148	0.144	0.243

*Components: 1 - Importance of early registration (in first trimester); 2 - Importance of ANC Check-ups during pregnancy; 3 - Importance of consumption of (IFA) tablets/syrup during pregnancy; 4 - Danger signs during pregnancy; 5 - Danger signs during post-natal period of pregnancy; 6 - Diet counseling; 7 - Importance of consumption of calcium during pregnancy; 8 - TT immunization during pregnancy; 9 - Warning signs in the new born and young infants; 10 - Importance of initiating breastfeeding within an hour of birth; 11 - Importance of exclusive breastfeeding the baby up to 6 months; 12 - Importance of maintaining personal hygiene